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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/939,767	08/28/2001	Shunpei Yamazaki	740756-2358	3748

31780 7590 12/16/2003

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EXAMINER	
HOGANS, DAVID L	

ART UNIT	PAPER NUMBER
2813	

DATE MAILED: 12/16/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/939,767	YAMAZAKI, SHUNPEI	
	Examiner	Art Unit	
	David L. Hogans	2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 November 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3,5-7 and 35-73* is/are pending in the application.

4a) Of the above claim(s) *62-73* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,5-7 and 35-61* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☒ Claim(s) *62-73* are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 August 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☒ Certified copies of the priority documents have been received in Application No. 09/094,345.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

This Office Action is in response to Amendment C filed on November 12, 2003.

Election/Restrictions

1. Newly submitted claims 62-73 are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons.

2. This application contains claims directed to the following patentably distinct species of the claimed invention.

Species I – appears to relate to Claims 62, 64, 66, 68, 70 and 72 (noting that the highly resistant region (100) is formed via phosphorus implantation according to Applicant's specification at page 6 lines 14-21)

Species II – appears to relate to Claims 63, 65, 67, 69, 71 and 73 (See Figures 3A-3D)

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 62-73 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Status of Claims

Claims 1-3, 5-7 and 35-61 are pending. Claims 4 and 8-34 are cancelled. Claims 62-73 are newly submitted and withdrawn.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1, 3, 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 408213317 to Yamazaki et al.

Claims 1, 3 and 6

Yamazaki et al. teaches: a silicon active layer containing a nickel catalytic element for promoting crystallization (See paragraphs 10-45 of translation and Figures 1-6); a gate insulating film (408) interposed between a heat resistant gate electrode (407) and the active layer (See paragraphs 10-45 of translation and Figures 1-6); and wherein a nickel concentration in the source/drain regions is at least one order of magnitude higher than a concentration of nickel in other regions (See paragraphs 10-45 of translation and Figures 1-6; further noting that paragraph [0029] teaches later processing steps that reduces the concentration of nickel in the channel by ½ or more)

Yamazaki et al. fails to explicitly teach wherein the nickel concentration in the source/drain regions is higher than a concentration of nickel in other regions by two or more orders of magnitude.

However, Yamazaki et al., in paragraphs 10-45 of translation and Figures 1-6, teaches a nickel concentration in the source/drain regions that is at least one order of magnitude higher than a concentration of nickel in other regions. Furthermore, Yamazaki et al. teaches that a later processing step reduces the concentration of nickel in the channel by ½ or more. Finally, Yamazaki et al. teaches that by lowering the concentration of nickel in the channel, a crystalline stabilized high speed TFT can be obtained.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to create a channel region with a nickel concentration of two orders of magnitude less than the source/drain regions to design a crystalline stabilized high speed TFT, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233 (CCPA 1955)

Claim 5

Incorporating all arguments of Claim 1 and noting that the semiconductor device is selected from the group consisting of a portable intelligent terminal, a head mounted display, a front projection type liquid crystal display, a cellular mobile telephone, a portable video camera, and a rear projection liquid crystal display (See paragraphs 10-45 of translation and Figures 1-6)

5. Claims 2, 7 and 54-57 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 408213317 to Yamazaki et al. (hereinafter "JP") in view of 5,459,090 to Yamazaki et al.

Claims 2, 7 and 54-56

Incorporating all arguments of Claim 1 and noting that JP fails to explicitly teach a gate electrode comprised by a tantalum.

However, Yamazaki et al., in column 8 lines 1-10, teaches a gate electrode comprised by tantalum (melting point of 2985 °C). Further, Yamazaki, in column 8 lines 10-15, notes that refractory metals, such as tantalum, are commonly employed because they offer lower resistivities.

It would have been obvious to one of ordinary skill in the art to modify JP by incorporating a gate electrode comprised by tantalum, as taught by Yamazaki et al., to lower the resistivity of the gate electrode.

Claim 57

Incorporating all arguments of Claims 1 and 54 and noting that JP, in paragraphs 10-45 of translation and Figures 1-6, teaches wherein the semiconductor device is selected from the group consisting of a portable intelligent terminal, a head mounted

display, a front projection type liquid crystal display, a cellular mobile telephone, a portable video camera, and a rear projection liquid crystal display.

6. Claims 35-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 408213317 to Yamazaki et al. (hereinafter "JP") in view of 5,459,090 to Yamazaki et al. in view of 5,764,321 to Koyama et al.

Claims 35, 37 and 40-41

Incorporating all arguments of Claim 1 and noting that JP teaches: a silicon active layer containing a nickel catalytic element for promoting crystallization (See paragraphs 10-45 of translation and Figures 1-6); a gate insulating film (408) interposed between a gate electrode (407) and the active layer (See paragraphs 10-45 of translation and Figures 1-6); and wherein a nickel concentration in the source/drain regions is at least one order of magnitude higher than a concentration of nickel in other regions (See paragraphs 10-45 of translation and Figures 1-6; further noting that paragraph [0029] teaches later processing steps that reduces the concentration of nickel in the channel by ½ or more)

JP fails to explicitly teach first and second insulating layers placed over the device.

However, Koyama et al., in Figure 3D and column 4 lines 61-68, teaches a laminate structure (311) of silicon nitride and polyimide. Finally, Koyama et al. teaches that this structure (311) acts as an interlayer insulating film.

It would have been obvious to one of ordinary skill in the art to modify JP by incorporating a silicon nitride and polyimide laminate, as taught by Koyama et al., to provide an interlayer insulator.

Claim 39

Incorporating all arguments of Claim 35 and noting that JP, in paragraphs 10-45 of translation and Figures 1-6, teaches wherein the semiconductor device is selected from the group consisting of a portable intelligent terminal, a head mounted display, a front projection type liquid crystal display, a cellular mobile telephone, a portable video camera, and a rear projection liquid crystal display.

Claims 36 and 38

Incorporating all arguments of Claim 35 and noting that JP fails to explicitly teach a gate electrode comprised by a tantalum.

However, Yamazaki et al., in column 8 lines 1-10, teaches a gate electrode comprised by tantalum (melting point of 2985 °C). Further, Yamazaki, in column 8 lines

10-15, notes that refractory metals, such as tantalum, are commonly employed because they offer lower resistivities.

It would have been obvious to one of ordinary skill in the art to modify JP by incorporating a gate electrode comprised by tantalum, as taught by Yamazaki et al., to lower the resistivity of the gate electrode.

7. Claims 42, 44 and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 408213317 to Yamazaki et al. (hereinafter "JP") in view of 5,426,064 to Zhang et al.

Claims 42 and 44

JP teaches: a silicon active layer containing a nickel catalytic element for promoting crystallization (See paragraphs 10-45 of translation and Figures 1-6); a gate insulating film (408) interposed between a gate electrode (407) and the active layer (See paragraphs 10-45 of translation and Figures 1-6); and wherein a nickel concentration in the source/drain regions is at least one order of magnitude higher than a concentration of nickel in other regions (See paragraphs 10-45 of translation and Figures 1-6; further noting that paragraph [0029] teaches later processing steps that reduces the concentration of nickel in the channel by ½ or more)

Yamazaki et al. fails to explicitly teach wherein the nickel concentration in other regions of the active layer is less than $5x10^{16}$ atoms/cm^3.

However, Zhang et al., in column 1 lines 52-68, teaches that $1x10^{17}$ atoms/cm^3 of nickel is needed in an amorphous layer to promote crystallization of silicon. The Examiner notes that JP teaches the concentration of nickel can be reduced by ½ or more in the channel and that ½ times $1x10^{17}$ equals $0.5x10^{17}$ or $5x10^{16}$.

It would have been obvious to one of ordinary skill in the art to modify JP by incorporating a channel region with less than $5x10^{16}$ atoms/cm^3 of nickel, as taught by Zhang et al., because a channel with a region of $1x10^{17}$ atoms/cm^3 of nickel promotes crystallization of an amorphous layer.

Claim 46

Incorporating all arguments of Claim 42 and noting that JP, in paragraphs 10-45 of translation and Figures 1-6, teaches wherein the semiconductor device is selected from the group consisting of a portable intelligent terminal, a head mounted display, a front projection type liquid crystal display, a cellular mobile telephone, a portable video camera, and a rear projection liquid crystal display.

8. Claims 43, 45 and 58-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 408213317 to Yamazaki et al. (hereinafter "JP") in view of 5,426,064 to Zhang et al. in view of 5,459,090 to Yamazaki et al.

Claims 43, 45 and 58-60

Incorporating all arguments of Claim 42 and noting that JP and Zhang et al. fail to explicitly teach a gate electrode comprised by a tantalum.

However, Yamazaki et al., in column 8 lines 1-10, teaches a gate electrode comprised by tantalum (melting point of 2985 °C). Further, Yamazaki, in column 8 lines 10-15, notes that refractory metals, such as tantalum, are commonly employed because they offer lower resistivities.

It would have been obvious to one of ordinary skill in the art to modify JP and Zhang et al. by incorporating a gate electrode comprised by tantalum, as taught by Yamazaki et al., to lower the resistivity of the gate electrode.

Claim 61

Incorporating all arguments of Claim 58 and noting that JP, in paragraphs 10-45 of translation and Figures 1-6, teaches wherein the semiconductor device is selected from the group consisting of a portable intelligent terminal, a head mounted display, a front projection type liquid crystal display, a cellular mobile telephone, a portable video camera, and a rear projection liquid crystal display.

9. Claims 47, 49 and 51-53 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 408213317 to Yamazaki et al. (hereinafter "JP") in view of 5,426,064 to Zhang et al. in view of 5,764,321 to Koyama et al.

Claims 47, 49 and 52-53

Incorporating all arguments of Claim 42 and noting that JP teaches: a silicon active layer containing a nickel catalytic element for promoting crystallization (See paragraphs 10-45 of translation and Figures 1-6); a gate insulating film (408) interposed between a gate electrode (407) and the active layer (See paragraphs 10-45 of translation and Figures 1-6); and wherein a nickel concentration in the source/drain regions is at least one order of magnitude higher than a concentration of nickel in other regions (See paragraphs 10-45 of translation and Figures 1-6; further noting that paragraph [0029] teaches later processing steps that reduces the concentration of nickel in the channel by ½ or more)

JP and Zhang et al. fail to explicitly teach first and second insulating layers placed over the device.

However, Koyama et al., in Figure 3D and column 4 lines 61-68, teaches a laminate structure (311) of silicon nitride and polyimide. Finally, Koyama et al. teaches that this structure (311) acts as an interlayer insulating film.

It would have been obvious to one of ordinary skill in the art to modify JP and Zhang et al. by incorporating a silicon nitride and polyimide laminate, as taught by Koyama et al., to provide an interlayer insulator.

Claim 51

Incorporating all arguments of Claim 47 and noting that JP, in paragraphs 10-45 of translation and Figures 1-6, teaches wherein the semiconductor device is selected from the group consisting of a portable intelligent terminal, a head mounted display, a front projection type liquid crystal display, a cellular mobile telephone, a portable video camera, and a rear projection liquid crystal display.

10. Claims 48 and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 408213317 to Yamazaki et al. (hereinafter "JP") in view of 5,426,064 to Zhang et al. in view of 5,459,090 to Yamazaki et al. in view of 5,764,321 to Koyama et al.

Claims 48 and 50

Incorporating all arguments of Claim 47 and noting that JP and Zhang et al. and Koyama et al. fail to explicitly teach a gate electrode comprised by a tantalum.

However, Yamazaki et al., in column 8 lines 1-10, teaches a gate electrode comprised by tantalum (melting point of 2985 °C). Further, Yamazaki, in column 8 lines

10-15, notes that refractory metals, such as tantalum, are commonly employed because they offer lower resistivities.

It would have been obvious to one of ordinary skill in the art to modify JP and Zhang et al. and Koyama et al. by incorporating a gate electrode comprised by tantalum, as taught by Yamazaki et al., to lower the resistivity of the gate electrode.

Response to Arguments

11. Applicant's arguments with respect to claims 1-3, 5-7 and 35-61 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David L. Hogans whose telephone number is (703) 305-3361 or (571) 272-1691, after February 9, 2004. The examiner can normally be reached on M-F (7:30-4:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr. can be reached on (703) 308-4940. The fax phone number for the organization where this application or proceeding is assigned is (703) 308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-1782.

dh

ERIK J. KIELIN
PRIMARY EXAMINER